Host Scheduler Service

Introduction:

Host Scheduler Service (HSS) as the name indicates is used to select a computational host to schedule a job. HSS is primarily used in LEAD to control application execution among different compute hosts (Currently Teragrid).

Application Deployment Scenario:

- LEAD Service Providers run tests on compute hosts and determine the appropriate GridFTP and GRAM services to use. A host description document is then registered with XRegistry using GFac Portlet interface. Then a host property is added to Host Scheduler Service database using mysql command line client or a GUI mentioning the preferred GRAM service to use (pre-web services or web-service Gram).

- LEAD Application Providers build applications on various compute hosts. After an application is tested, an entry is added to Host Scheduler Service with Application Service QName, User DN (typically DrLEAD –LEAD Community Credential) and an associated rank.

Schedulers:

LEAD Portal can schedule workflow in 3 different modes:
1. LEAD or Default scheduler
2. SPRUCE Urgent Computing Scheduler
3. VGRADS Virtual Grid Scheduler

Execution Scenarios:

Reservation Mode:

When a stand in reservation is obtained on a compute host the rank of the application entry on the host is set to lowest number (usually 0 or 1).

When more than one compute hosts are healthy hosts are sorted on the order of preference based on reliability levels.

Normal Mode:

When application is built and ready to use on more than one host a Batch Queue Prediction Tool called QBETS from University of California at Santa Barbara is used to
estimate the lowest queue wait time and the application is scheduled on that compute host where the probability of execution is more.

Black out hosts:
Eminent to the most frequent problems with compute cluster reliability and maintenance schedules and the stability of grid middleware, there is a need for black list a particular host or service. When job failures on a compute host is noticed or if a machine is in maintenance or draining, ranks of all applications on the host are set to high numbers which prevents from scheduling an application on the non-healthy cluster.

DataBase:

mysql> describe hosts;
+----------+---------+-------+------+----------+-------+
| Field    | Type    | Null  | Key  | Default  | Extra |
+----------+---------+-------+------+----------+-------+
| serviceName | varchar(100) | NO    |     | NULL     |       |
| userName  | varchar(100) | NO    |     | NULL     |       |
| hostName  | varchar(100) | NO    |     | NULL     |       |
| scheduler | varchar(100) | NO    |     | NULL     |       |
| rank      | int(11)  | NO    |     | 0        |       |
+----------+---------+-------+------+----------+-------+
5 rows in set (0.00 sec)

mysql> describe properties;
+----------+---------+-------+------+----------+-------+
| Field    | Type    | Null  | Key  | Default  | Extra |
+----------+---------+-------+------+----------+-------+
| hostName | varchar(100) | NO    |     | NULL     |       |
| propName | varchar(100) | NO    |     | NULL     |       |
| propValue| varchar(100) | NO    |     | NULL     |       |
+----------+---------+-------+------+----------+-------+
3 rows in set (0.00 sec)

**Host Scheduler Service Wsdl:**

```xml
<wsdl:definitions xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
xmlns:tns="http://lead.extreme.indiana.edu"
xmlns:soap12="http://schemas.xmlsoap.org/wsdl/soap12/"
xmlns:mime="http://schemas.xmlsoap.org/wsdl/mime/"
xmlns:http="http://schemas.xmlsoap.org/wsdl/http/"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
xmlns:xsd1="http://lead.extreme.indiana.edu/xsd"/>
```
<xsd:schema targetNamespace="http://lead.extreme.indiana.edu/xsd" elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xsd:element name="hostGivenSchedularRequestType">
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element type="xsd:string" name="serviceName" />
        <xsd:element type="xsd:string" name="userName" />
        <xsd:element type="xsd:string" name="schedular" />
      </xsd:sequence>
    </xsd:complexType>
  </xsd:element>
  <xsd:element name="hostRequestType">
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element type="xsd:string" name="serviceName" />
        <xsd:element type="xsd:string" name="userName" />
      </xsd:sequence>
    </xsd:complexType>
  </xsd:element>
  <xsd:complexType name="hostproperty">
    <xsd:sequence>
      <xsd:element type="xsd:string" name="name" />
      <xsd:element type="xsd:string" name="value" />
    </xsd:sequence>
  </xsd:complexType>
  <xsd:element name="hostResponseType">
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element type="xsd:string" name="hostName" />
        <xsd:element type="xsd:int" name="rank" />
        <xsd:element type="xsd1:hostproperty" name="property" maxOccurs="unbounded" />
      </xsd:sequence>
    </xsd:complexType>
  </xsd:element>
</xsd:schema>

<wsdl:types>
  <xsd:schema targetNamespace="http://lead.extreme.indiana.edu" name="tns">
    <xsd:element name="getIdealHostGivenSchedularIn">
      <xsd:complexType>
        <xsd:sequence>
          <xsd:element ref="tns:hostGivenSchedularRequestType" />
        </xsd:sequence>
      </xsd:complexType>
    </xsd:element>
    <xsd:element name="getIdealHostGivenSchedularOut">
      <xsd:complexType>
        <xsd:sequence>
          <xsd:element ref="tns:hostResponseType" />
        </xsd:sequence>
      </xsd:complexType>
    </xsd:element>
    <wsdl:portType name="HostSchedulerServicePortType">
      <wsdl:operation name="getIdealHost">
        <wsdl:input message="tns:getIdealHostGivenSchedularIn" />
        <wsdl:output message="tns:getIdealHostGivenSchedularOut" />
      </wsdl:operation>
    </wsdl:portType>
  </xsd:schema>
</wsdl:types>
name="HostSchedulerServiceSOAP11Binding"><soap:binding style="document" transport="http://schemas.xmlsoap.org/soap/http" /></wsdl:operation
name="getIdealHost"><soap:operation style="document"
soapAction="http://rainier.extreme.indiana.edu:12346/axis2/service/hostscheduler/getIdealHostGivenSchedular" />
<wsdl:input><soap:body
namespace="http://lead.extreme.indiana.edu" use="literal" />
<wsdl:operation
name="getIdealHost"><soap12:operation style="document"
soapAction="http://rainier.extreme.indiana.edu:12346/axis2/service/hostscheduler/getIdealHostGivenSchedular" />
<wsdl:input><soap12:body
namespace="http://lead.extreme.indiana.edu" use="literal" />
<wsdl:output><soap12:body
namespace="http://lead.extreme.indiana.edu" use="literal" /></wsdl:output></wsdl:operation></wsdl:binding>
<wsdl:operation
name="getIdealHost"><http:operation location="getIdealHost" />
<wsdl:input><mime:content type="text/xml" />
<wsdl:output><mime:content type="text/xml" /></wsdl:output></wsdl:operation></wsdl:binding>
name="HostSchedulerService"> </wsdl:port
binding="tns:HostSchedulerServiceSOAP11Binding"
name="HostSchedulerServiceSOAP11port0"><soap:address
<wsdl:port binding="tns:HostSchedulerServiceSOAP12Binding"
name="HostSchedulerServiceSOAP12port0"><soap12:address
<wsdl:port binding="tns:HostSchedulerServiceHttpBinding"
name="HostSchedulerServiceHttpport0"><http:address

Future Work:

1. Develop a portlet interface to administer and configure application scheduling.

2. Work with Teragrid Science Gateways Team to generify the HSS usage so as to enable use by other Science Gateway Partners